THE TREATMENT OF PNEUMOCOCCIC INFECTION OF THE LUNG, OR CROUPOUS PNEUMONIA

A CLINICAL LECTURE DELIVERED AT THE HOSPITAL OF THE UNIVERSITY OF PENNSYLVANIA

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GENTLEMEN: To-day I wish to discuss with you the management of one of the most important of the acute infectious diseases, of that acute infectious disease of the nature of which you should have a clear conception, and with the approved means of treating which you should be familiar. I refer to pneumococcic infection, or, as it is more commonly called, croupous or lobar pneumonia. The designation pneumococcic infection is preferable to croupous or lobar pneumonia chiefly for the reason that the inflammatory lesions in the lung may be the smallest part of the process going on in the body, and because the extent of the lung involvement has not much to do with the severity of the illness of the patient. It is important to bear in mind that the local lesions in the lung are accountable for some, but not for all, of the patient's symptoms; that the patient ill with croupous pneumonia is suffering from a general infection with the pneumococcus; that organs other than the lungs may reveal morbid lesions at least as well marked as the local pulmonary lesions; that in some cases these other lesions are susceptible of recognition; and that the severity of the clinical manifestations in a given case depends upon the virulence of the infecting pneumococcus and the resistance offered by the patient. Thus we find that the extent of the local lesions, be they in the lung or elsewhere, bear no necessary relation to the severity of the general symptoms; that these, on the contrary, are an expression of the toxemia. The greater the virulence of the infecting micro-organism, and the less the tissues of the patient are able to neutralize the

toxins, the greater the resulting toxemia. Hence it is that of two patients with the same extent of lung involvement, the one will present little or no toxemia, while the other will be extremely toxic. The observation of large numbers of cases has taught us that the dangers to be apprehended in pneumonia are due almost entirely to the toxemia, and that in 90 per cent. of the fatal cases death results from toxemia, and not from extent of lung involvement or mechanical embarrassment of the circulation.

In the treatment of all diseased conditions, it is well to proceed upon a definite basis, remembering, however, that we are treating a patient rather than disease in the abstract, and that we shall have to modify our treatment in accordance with certain well recognized principles depending upon the peculiarities of the patient and the exigencies of the case. Indications for treatment should be sought in, and our treatment based upon, (1) The diagnosis of the case; (2) our conception of the morbid process; (3) the symptoms of the disease; (4) the results of an examination of the different organs and structures of the body; and (5) suggestive facts that we may elicit from the social history, the family history, and the previous medical history of the patient.

Treatment based upon the Diagnosis.—Proceeding upon this definite plan, the first indications for treatment are based upon the diagnosis of the case. In the event of certain diseased conditions, such as syphilis, diphtheria, malaria, we have immediate recourse to certain well recognized specifics; that is, the diagnosis carries with it a positive indication for a certain specific remedy. It matters not what the character of the disease, whether or not it be attended by complications, nor whatever else we do, we administer at once the specific remedy. As regards pneumococcic infection or croupous pneumonia, Have we a specific? The only remedy for which specific properties are claimed is the so-called anti-pneumococcic serum. Of this it may be said that its real value has not been definitely determined, and the general professional opinion is one of hope rather than of satisfaction. I have used it in a moderate number of cases, in a sufficient number to enable me to say, (1) that it has not seemed to cut short the course of the disease,—I am satisfied that it has not brought about nor hastened the crisis; (2) that it has no influence on the extent of the local inflammatory lesions; (3) that possibly it exerts some

little influence for good on the toxemia; and (4) that it does no harm. The most, then, that I can say about it at present is that it does no harm. The only ill effects that I have observed following its use was a moderate diminution in the amount of urine in several cases, particularly in one case, a child of 12 years. However, when we are brought face to face with a severe case of pneumococcic infection and bear in mind the high mortality that attends the disease, we should have recourse to such remedies as we believe will exert a beneficent influence; and inasmuch as the antipneumococcic serum does no harm, and may do some good, I accord it a qualified approval. It should be administered hypodermatically in doses of 20 c.c. every four to six hours.

Treatment based upon Our Conception of the Morbid Process.—The next indication for treatment is based upon our conception of the morbid process. As I have already intimated, croupous pneumonia is a general infection with the pneumococcus and a local inflammatory lesion in the lung. Based upon this conception of the process, our endeavors should be directed (1) toward arresting, limiting, or modifying the extent of the local inflammatory lesions in the lung, since it is here that the toxins are manufactured; (2) toward assisting nature to eliminate the toxins; and (3) toward counteracting the effects of the toxins. With regard to arresting, limiting, or modifying the extent of the local inflammatory lesions, it is important to bear in mind that, although the pneumococcic infection is a general process, there is nevertheless a local lesion in the lung that by no means is to be ignored. By controlling this, we benefit our patient to a very great degree. Suppose, then, that we are called to see our patient within the first 24 hours of his illness. We detect in all probability evidences of infection or toxemia—fever, furred tongue, probably some little gastritis and constipation, and possibly certain symptoms that suggest local disorder in the lungs. There are as yet no physical signs of involvement of the lungs; we are not able to say which lung is or is to be affected, nor how extensive the local inflammation may become; although we may be quite certain that the man is in the first stage of pneumococcic infection of the lung, or croupous pneumonia. What shall we do? We reason that, inasmuch as the process is inflammatory, we should, as in all inflammatory conditions, lower the blood-pressure. We endeavor to control the degree

of congestion in the lung by diverting the blood elsewhere in the body. The most serviceable way to lower the blood-presure in these circumstances is by means of laxatives, of which calomel and the salines are the best. In most cases I am in the habit of using calomel for two reasons—because of its well-known laxative effect and because it is a local antiseptic. The pneumococcus, the cause of the infection, as is generally known, is found in the mouth of even healthy individuals; in those ill with pneumonia it is found in the mouth and the upper air passages in increased numbers, and it is truly pathogenic. If, then, we administer calomel in such a manner that it may exert its local antiseptic action, we take steps toward preventing the spread of the local inflammation and toward reducing the degree of the toxemia. Ten grains (0.6 gram) of calomel should be given dry on the tongue. The patient should be asked not to swallow it, but to allow it to mix with the juices of the mouth so that it may come in intimate contact with the mucous membrane of the mouth, fauces, and upper air passages, whereupon it may be swallowed. This is good, sensible therapeutics, based upon sound principles. It furnishes us with a scientific explanation of the empirical success attending the use of calomel in the treatment, a form of treatment in especial favor among the older physicians, particularly in the South. There many cases of pneumococcic infection are called bilious pneumonia, and the patients are treated with enormous doses of calomel—20 to 30 grains (1.3 to 2 gram), sometimes repeated. There is no occasion for repeating the dose (and 10 grains suffice), but the use of the remedy is unquestionably of service. In addition to exerting a local antiseptic action in the mouth, by reason of its laxative action it serves to lower the blood-pressure and to reduce the frequency of the heart's action and the respiration rate.

Furthermore, we may control the inflammatory lesions in the lung by means of certain local applications. Of these, dry cups are the best. In the early stages we may be uncertain which lung is affected; put the cups on both sides, and put on not one cup or two cups, but 20 or 30 cups. I have the greatest confidence in the use of dry cups applied over the chest—first generally, and later locally, over the seat of lung involvement. Cup when you are called to see the patient; and if, when you call later in the day or evening, improvement is not marked, cup again. Repeat the cupping;

twice or thrice in the first 24 hours, and twice in the second 24 hours; and if on subsequent days you detect congestion of a portion of the lung previously uninvolved, cup again over that particular region. You will find that the cupping relieves the pain to a very great extent, and that in almost every case it relieves the breathing. Commonly, if the respirations were 35 a minute before the cupping, they will be 30 or even less after the cupping.

In addition to the cupping, the local use of cold is of great service. This may be applied either by laying cloths on a block of ice and then upon the chest, by laying cloths wrung out of ice-water on the chest, by the use of the ordinary ice-bag, or the rubber or Leiter coil through which cold water is made to circulate. We may use the cold continuously or intermittently. The latter is the preferable way. Personally I have been very well satisfied with Baruch's method. Baruch directs that the chest be enveloped with a cotton or linen jacket wet with water at a temperature of 60° F., and then covered with a flannel bandage. This is allowed to remain on until the patient's temperature falls to 100° F., whereupon the ordinary dry jacket is substituted. This procedure is to be repeated should the temperature again become high. In other cases I direct that the nurse should apply to the patient's chest, front and back, cloths wrung out in ice-water. These should be changed every fifteen minutes for two hours, when they may be discontinued for two hours, and then repeated should the temperature again become high.

There is some evidence that the local use of cold controls somewhat the local inflammation in the lung; certain it is that it promotes the well-being of the patient. To such a degree does it relieve the pain, commonly of pleural origin, that the patients ask for it. But it is of special service in counteracting the effects of the toxemia. Each application of cold deepens the respirations and lessens or dissipates the hypostatic congestion of the lung that has developed in consequence of a little failure of the heart. The heart action is stimulated, and in consequence of this and the improved breathing there is better oxygenation of the blood; cyanosis which had developed is soon lessened, delirium grows less, the temperature falls, and other manifestations of toxemia diminish. I am confident that I have witnessed the greatest amount of good follow this method of stimulating the cardiac and respiratory mechanisms by what may be looked upon as the heroic application of cold. Should you

use this, you will, of course, dispense with the ice-bag that you may have used during the first 24 hours. In the use of these ice-water applications it is essential that the patient react. We expect that the ice-cold cloths will get warm in a very short time, and when they have become warm they must be changed. Should they not become warm, should they remain cold, it is an indication that the patient has not reacted, that they are doing no good, and they should not be used. In the later stages of pneumonia hot applications, which possibly promote resolution, are sometimes more efficient than cold applications. These may be merely flannel cloths wrung out of hot water and sprinkled with a small amount of turpentine (the ordinary turpentine stupe), or a flaxseed poultice, or hot-water bags carefully guarded by wrapping them in flannel or cloths, or even the old-fashioned cotton jacket.

We have now accumulated considerable clinical and experimental evidence that goes to show that the degree of toxemia in an infectious disease depends upon the activity of the kidneys, that the toxins are more freely liberated by the kidneys than by the skin or the intestinal tract. With a view, then, to assist nature to eliminate the toxins, we endeavor to keep up the action of the kidneys. We recognize that the renal activity depends upon strength of the heart, and this upon the tone of the nervous mechanism that controls the heart and the blood-vessels.

We favor the elimination of the toxins by keeping the circulation active, and thus promoting free diuresis. For this purpose, I am in the habit of ordering strychnin, $^1/_{30}$ to $^1/_{40}$ grain (0.002 to 0.0015 gram), every four hours. This is a routine prescription of mine in all cases of pneumococcic infection, and I begin with the small dose under the impression that I shall probably have to increase it, but with the idea of fortifying the circulation against the deleterious effects of the toxins that are sure to develop. Furthermore, when the renal secretion diminishes, when the daily amount of urine falls below the normal, I order that which physiologically is the best renal stimulant—water, in large amounts. I instruct the nurse or the attendant that the patient be given large amounts of water, more than they ask for (and usually on account of thirst they ask for considerable). I see to it that a certain amount is given at stated intervals, so that a total quantity of two or three quarts (liters) is given in the 24 hours. In many cases it is

preferable to use a water that is mildly diuretic, and for this reason I frequently prescribe Poland water, some good lithia water, or other water that contains a moderate amount of saline. Finally with increasing high temperature and progressive increase of the toxemia, we cannot do better than resort to additional hydrotherapeutic measures. Sponge baths, tub baths, ice packs, or douches, may be employed—the particular procedure depending upon the conveniences of the household, the degree of relief afforded, and the response secured.

In some cases we find that the foregoing measures do not suffice, or, having been of avail in the early stages of the disease, later they lose their efficacy; the renal secretion lessens, vascular tension becomes reduced, and the pulse weak and dicrotic. The toxemia has increased, and its pernicious effects are more manifest. Under these circumstances the strychnin should be increased to $^1/_{20}$ grain (0.003 gram) four times daily, and to this we may add a moderate dose of caffein, 1 to 2 grains (0.06 to 0.12 gram), three times a day, or cocain, $\frac{1}{4}$ grain (0.015 gram), three times a day. Under these circumstances, however, the best remedy is hypodermoclysis —the injecting of salt solution under the skin. In a case of pneumococcic infection, if the daily amount of urine falls below 40 or 30 ounces (1000 c.c.), I begin with the injection of salt solution into the rectum, from 500 to 1000 c.c. (as may be well borne and retained by the patient), once or twice a day. In most cases there is an immediate increase in the amount of urine and a concurrent lessening of the frequency of the heart-beat and an increase in the strength of the pulse; commonly, also, the delirium lessens, the temperature falls a little, and the respirations become less frequent and deeper. In most cases, however, it is necessary to go further. If the toxemia is not relieved, if the heart-beat becomes more rapid, and the respirations increased, I immediately resort to the injection of salt solution under the skin—once or twice in the 24 hours, sometimes every 8 hours. Although we may scarcely look upon hypodermoclysis as a specific in the treatment of pneumococcic and other infections, it is one of the most serviceable means of treatment at our command. A simple solution of ordinary salt (sodium chlorid), a teaspoonful to a pint of boiled water, may be used and injected at a temperature of 100° F. Or one may use certain of the tablets or concentrated fluids prepared by some of

the manufacturing chemists which much facilitate the ready preparation of the solution, or, what in some respects is better, a solution that is sometimes spoken of as a physiologic salt solution may be prepared according to the following formula, a modification of Ringer's original formula:

Sodium chlorid	0.9
Calcium chlorid	0.026
Potassium chlorid	0.01
Distilled water	99.064 (Cushing).

Although in most all cases hypodermoclysis is followed by marked improvement in the condition of the patient, particularly in increased secretion of urine and corresponding increased elimination of toxins, our measures may not be sufficient. The cardiac and respiratory mechanisms are failing on account of the action of the toxins, and they require further stimulation. It is in these circumstances that the action of the drugs that I have already mentioned may be much supplemented by the local and systematic use of cold to the chest.

In some cases when the pernicious effects of the toxins are becoming marked, it becomes necessary to use other measures to counteract their effects. It may be necessary still further to increase the dose of the strychnin, and to give the cocain or caffein at more frequent intervals. In these circumstances preparations of ammonium also are of service. What of alcohol? There is danger in the use of alcohol early, and it is a serious matter to grade the dose to meet the varying indications. If the patient be an alcoholic subject, you cannot begin too soon with the administration of alcohol, nor is it likely that you can give too much. If the patient be a non-alcoholic subject, however, you must be cautious with alcohol, preferring to reserve it for a period that may come later in the disease when you want to tide the patient over a critical period of, say, 12 or 24 hours. In the ordinary case, I rarely use alcohol; in fact, I never use it if I can avoid it, and when I do use it I usually do not exceed 2 or 3 ounces (60 to 100 c.c.) in the 24 hours—say a half-ounce (15 c.c.) every four to six hours. When there comes a time that I feel that I have only to keep the patient alive for 12 or 24 hours to get him to the crisis, I frequently increase the dose, or I substitute brandy or champagne. Champagne is a splendid stimulant for a short time, and usually

agrees well with the patient, unless contraindicated by gastritis or other condition.

In a given case, basing our treatment upon the suggestions that I have already given—suggestions founded upon our conception of the morbid process—it must be apparent that we are doing about all that we can to relieve our patient. It usually becomes necessary, however, to seek indications for treatment in the symptoms of the affection in the individual case, and it is always necessary to bear in mind that our treatment should be influenced by the results of an examination of all the organs of the patient.

Treatment based upon the Symptoms and on Examination of the Different Organs of the Body.—Of the symptoms which of themselves may demand treatment, pain is probably the most important, certainly in the early stages, when it is sometimes extremely urgent. Although a symptom that we like to see in pneumonia, since absence of pain is significant of failure to react to the pneumococcic infection, the pain itself is distinctly depressing and should be mitigated. Usually due to an infective pleuritis, it is commonly situated at the lower part of the chest. Should the local external applications previously mentioned not suffice to relieve the pain, we must have recourse to anodynes internally. Of these the most efficient is unquestionably some form of opium. I prefer morphin hypodermatically and in moderate doses, but sufficient to relieve the pain. In some cases rather large doses must be given, ½ grain (0.03 gram), repeated in a half-hour, if necessary. Of course, while the pain lasts it counteracts the somewhat depressing effect of the morphin, but should the pain subside too rapidly, we may have some unpleasant symptoms of morphinism. These, however, are not dangerous unless there is disease of the kidneys, in which circumstances it may be advisable to administer caffein to stimulate the renal secretion and to counteract the effect of the morphin. After the first 24 or 48 hours, however, we rarely feel called upon to administer opium on account of its tendency to lessen the secretion of urine, which after this time is likely of itself to diminish as a direct consequence of the toxemia. In the early stages, however, opium is of distinct value; it sustains the circulation, lowers blood-pressure, and prevents the shock incidental to pain. In some cases, paregoric, deodorized tincture of opium, or Dover's powder, may suffice to relieve the pain. As a matter of

fact, Dover's powder is frequently of excellent service, relieving the pain and promoting a mild diaphoresis. It may be given alone in doses of 2 grains (0.13 gram) every three or four hours, or it may be combined with certain other analgesics and stimulants. Should the pain be associated with severe coughing, so that it is to be presumed that violent muscular action contributes to its production, it may be controlled by the use of some of the milder derivatives of opium, such as codein in $\frac{1}{4}$ to $\frac{1}{2}$ grain (0.015 to 0.03 gram) doses, or heroin in $^1/_{12}$ grain (0.005 gram) doses, every three or four hours.

Of the symptoms on the part of the nervous that of themselves demand treatment, delirium is the most important; it is sometimes severe and of a restless, exhausting character. It is usually an expression of the toxemia, and is usually to be combated by the remedies that we employ against the toxemia—antitoxin(?), and measures that promote elimination, diuretics, diaphoretics, and laxatives. It is often diminished when the pain is lessened, and sometimes in asthenic pneumonia it is improved by the administration of cardiac stimulants. Of these, I have already mentioned several, especially strychnin, which in these cases should be administered hypodermatically, and alcohol, which in these cases is often of service. Furthermore, the salts of ammonium are of value. Thus you may give the aromatic spirit in doses of 15 to 30 minims (1 to 2 c.c.) every hour or two; or ammonium carbonate (in some menstruum that diminishes its irritating effect upon the mucous membrane of the stomach, such as a little mucilage of acacia) in doses of 5 grains (0.3 gram) every two hours; or ammonium chlorid in 5 grain (0.3 gram) doses every two hours; or ammonium iodid in 2 to 3 grain (0.13 to 0.2 gram) doses every two hours, or somewhat larger doses at longer intervals. In some of these cases, camphor also will be found to be an excellent remedy, in doses of 1 to 2 grains (0.06 to 0.13 gram) by the mouth, or (the smaller dose) hypodermatically at one-hour intervals.

In certain severe cases of pneumococcic infection of the lung a condition arises that is difficult to distinguish from true meningitis. The head is retracted, the muscles of the neck are stiff, and from time to time slight convulsions occur. If conscious, the patient complains of intense headache, and if unconscious, he makes various motions indicating that there is pain in the head. There

is photophobia, intoleranee of noises, and oeeasionally tache cérébrale. Kernig's sign is often readily obtained. The diagnosis under these circumstances is sometimes a matter of eonsiderable difficulty—espeeially when we remember that many eases of meningitis are due to infection with the pneumoeoeeus, and that meningitis may arise as a complication of the pneumococcic infection of the lung. If the symptoms are mild and there is reason to believe that the eondition is only that sometimes spoken of as "wet brain," or what the French eall "meningism," it is scareely neeessary to do more than apply an iee-eap to the head. If, however, there is doubt as to the true nature of the eondition, it is probably better to perform lumbar puneture. This is a very simple operation and, if performed with reasonable skill, perfeetly safe. In meningitis it is believed to be of diagnostie value only, although I have seen one or two patients who appeared to be much benefited by it. In meningism, however, it often relieves the symptoms promptly, and it apparently has an exeellent influenee on the eourse of the disease. Recently in the hospital we have had reeourse to it in several eases of pneumoeoeeie infeetion, and in several eases of typhoid fever, with the greatest and immediate benefit to the patients.

In some eases, a most serious and important eomplieation oeeurs—failure of the eirculation. This is due to the toxemia, to the action of the toxin on the nervous and muscular meehanism of the eirculatory apparatus, and may be hastened or rendered more serious by pre-existing disease of the heart. When due merely to toxemia, —that is, when oeeurring in young subjeets previously robust,— our object should be to eombat the toxin and to promote its elimination by the measures previously mentioned. At the same time we endeavor to tide the patient over the eritieal period by resort to different eardiae stimulants, of whieh a number have already been mentioned. In addition, in some of these eases, good results attend the use of nitroglyeerin, if there is high blood-pressure; or digitalis, or Merck's German digitalin hypodermatieally, in $^1/_{12}$ grain (0.005 gram) doses, if the blood-pressure is low. Sometimes, if there is edema of the lungs and the vessel tone is lowered, atropin may be of serviee. When there are symptoms of engorgement of the right heart,—precordial distress, eyanosis, weakness of the heart aetion, feeble, irregular pulse, loss of the museular element of the first sound of the heart, loss of aeeentuation of

the previously accentuated pulmonary second sound, etc.,—if it be not too late in the course of the disease, the withdrawal of a small amount of blood may prove exceedingly beneficial. This subserves the double purpose of relieving the over-distended right heart and of removing a certain amount of toxins. Its good effect is seen in lessening of the cyanosis, increase in the force of the heart-beat and the pulse, lessening of the cardiac dulness to the right, lessening of the distended jugular veins, etc. In all cases the abstraction of the blood should be followed immediately by hypodermoclysis, and in some cases, particularly in those in which the arteries appear underfilled, it is probably better to substitute the hypodermoclysis for the venesection. In more desperate cases, intravenous injection of the salt solution may be employed. Although bleeding should not be resorted to in every case, it is well to bear in mind that sometimes in the later half of the disease, when the right heart is engorged, venesection (in some cases wet cups to the chest) may be of distinct service.

Cases in which there is a good deal of associated bronchitis, especially in old people, require careful management. If there is much secretion, atropin judiciously administered in small doses may be of much benefit. In these cases, also, preparations of ammonium are of value, not because of an influence that they may exert upon the pneumococcic infection, but because of their effect on the bronchial inflammation. The iodid, chlorid, and carbonate of ammonium especially are to be commended.

The gastro-intestinal tract demands attention throughout the course of the pneumococcic infection. When nausea and vomiting occur in the early stages of the disease, they may be relieved by restricting the diet to milk for a short time, by a small amount of calomel, and possibly a little bismuth. Later, intestinal symptoms are more serious, in fact very grave; and I know of nothing more important to impress upon you than the importance of watching the intestinal condition in pneumococcic infection. Watch the toxemia, watch the nervous system, watch the heart, but watch also the intestinal tract. The first signs of tympany demand attention, and so also do the first evidences of colitis. Both of these may occur together. I am satisfied that in many cases death results from the extreme tympany interfering with cardiac and respiratory action. Upon the first evidence of tympany or colitis, therefore, use moder-

ate purgation, and then wash out the lower bowel. For irrigating, you may use boric acid solution or normal salt solution once or twice a day. If you believe that the tympany results from an atonic condition of the intestines induced by the toxemia, you may employ hypodermatic injections of eserin, $^1/_{100}$ to $^1/_{60}$ grain (0.00065 to 0.001 gram), four times a day. Fortunately, eserin is not contraindicated; it is a good general stimulant, and promotes the general well being of the patient. Should colitis develop, if slight, it may be controlled by bismuth and by following the saline enteroclysis with an enema of starch water to which 5 to 10 drops (0.30 to 0.60 c.c.) of tincture of opium may be added. In some cases a mild antiseptic mixture by the mouth will be of service, such as:

R	Beta naphtol	25 grains	1.50
	Bismuth subnitrate	50 grains	3.
Mix, and make into ten capsules.			
S.	One capsule every four hours.		

Or the following:

R	Carbolic acid	15 grains	1.0
	Bismuth subgallate	2 drams	8.0
	Mucilage of acacia		
	Glycerin		
	Peppermint water, of each enough to make	2 ounces	60.0
Mix. S.—One teaspoonful every three hours.			

From what I said at the beginning of the lecture, it is apparent that it is extremley important to watch the condition of the kidneys, especially the amount of urine. Should the urine fall below 20 ounces (600 c.c.) in the 24 hours, the prognosis becomes bad. Unfortunately, many cases of pneumococcic infection occur in persons already the subject of renal disease, and in these, of course, the prognosis is very bad. We should endeavor to keep the kidneys as active as possible, by the use of salt solution, by giving the patient plenty of water to drink, and by cupping over the region of the kidneys. In these cases, also, we should promote the action of the other emunctories.

Examination of the blood scarcely affords us any indications for treatment. We are always happy to observe a leukocytosis in pneumococcic infection, but should there be no leukocytosis (which

renders the prognosis at least anxious), we have no certain means of increasing the number of the leukocytes.

Treatment based upon the History.—From the social history of our patient we may sometimes derive indications for treatment. Thus, in the old, we resort more quickly to stimulants than in the young, and we give larger amounts of alcohol to alcoholic subjects. The previous medical history of the patient, such as a previous attack of endocarditis, or a previous attack of pneumococcic infection itself, causes us to modify both our prognosis and our treatment accordingly. And the same may be said, also, of certain facts that we derive from the family history of the patient. It is doubtless known to you that some families seem especially susceptible to infection with the pneumococcus, and that the members of such families are more likely to die than others. In this respect our prognosis and our treatment must be modified.

Finally, I need only say that the diet of your patient ill with a pneumococcic infection should be substantial, nourishing, easily digested. Fluids, especially milk, are preferable in the early days, but later certain soft articles may be added.

In conclusion, I beg you to remember that each case of pneumococcic infection is a law unto itself; that as yet we have no routine treatment upon which we can rely as we do upon the cold-bath treatment in typhoid fever; that we must treat each patient partly with reference to the peculiarities of the infection, partly with reference to his or her personal idiosyncrasies, and partly with reference to the complications that may arise; and that therefore you should have at your command abundant resources that will enable you to change your treatment from day to day should the exigencies of the case demand it.